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June 19, 2002

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th St., S.W., Counter TW-A325
Washington, D.C. 20554

Re: *Ex Parte* Presentation
IB Docket Nos. 02-19 and 01-96

Dear Ms. Dortch:

On June 18, 2002 José Albuquerque and Suzanne Hutchings of Teledesic LLC and Mark Grannis and the undersigned of Harris, Wiltshire & Grannis, LLP met with Jennifer Gilsenan, Bob Nelson, Kal Krautkramer, Scott Kotler, Alyssa Roberts, and Arthur Lechtman of the International Bureau regarding the recently released order on NGSO FSS sharing in the Ku band and the pending NPRM regarding NGSO FSS sharing in the Ka band. In this presentation Teledesic provided background on its concerns regarding the definition of in-line events adopted in the order on NGSO FSS sharing in the Ku-band.

Specifically, Teledesic explained why defining in-line interference events based on bit error rate (BER) time allowances is more conducive to successful coordination negotiations than a 10° avoidance angle as adopted in the Ku-band sharing order. Teledesic also explained the importance of coordination priority for successful cofrequency sharing among licensees from different processing rounds and cautioned against the adoption of overly prescriptive default sharing mechanisms that might inhibit rather than promote coordination negotiations among NGSO FSS licensees. A copy of this presentation is included with this letter.

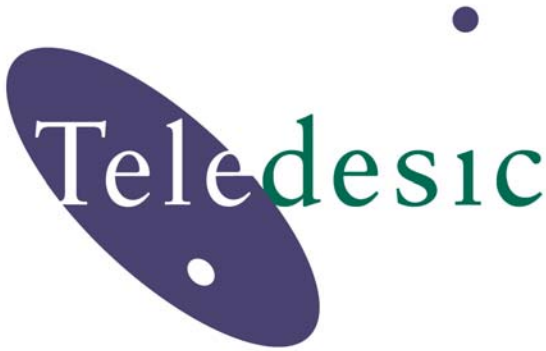
If you have any questions or require any additional information, please do not hesitate to contact me at (202) 730-1331.

Respectfully submitted,

Kelly S. McGinn
Counsel to Teledesic LLC

Enclosure

cc: Jennifier Gilsenan
Bob Nelson
Kal Krautkramer
Scott Kotler
Alyssa Roberts
Arthur Lechtman



Some Aspects of the Ku-Band Order and of the Ka-Band NPRM Addressing Service Rules for NGSO FSS Systems

Basic Points Being Addressed

- Definition of In-Line Events
- Coordination Priority and Coordination Rules

Definition of In-Line Events: Background

- In the Ku-Band Order, the Commission has chosen "Avoidance of In-Line Events" as the method to be used by licensees to share spectrum
  - In case licensees cannot agree during coordination on a definition for in-line events (i.e. on a definition of the periods of time during which both systems cannot simultaneously access the full available spectrum without implementing mutually agreed mitigation techniques) then in-line events will be defined by a fixed 10° earth station-based angle
- In the Ka-Band NPRM, the Commission has offered four different options for spectrum sharing and "Avoidance of In-Line Events" is one of the options
  - For this option the Commission proposes that the definition of in-line events be based on the percentage of time that a specified bit error rate (BER) is exceeded

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Three Reasons Why 10° is Not the Answer

- A uniform earth-station-based angle of 10° is too inaccurate to serve as a useful definition of an in-line interference event. In fact, *any* definition based on a fixed angle for all systems will be so crude that it will create more problems than it solves.

- The Commission's reasons for choosing the least accurate of the definitions that were considered do not justify the decision.

- A definition based on the percentage of time that a specified bit error rate (BER) is exceeded will provide a much more accurate definition that has none of the deficiencies of the fixed-angle approach and provides much more incentive for productive coordination discussions.

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A “Fixed-Angle” Definition Is Too Inaccurate to Be Useful

- The angles that actually define in-line events between proposed system vary widely, and are not even closely approximated by any fixed angle
- The inaccuracy of the fixed-angle definition cannot be adequately corrected by adopting a second fixed angle for “high-powered” systems
- It Is Sometimes More Efficient to Use a Satellite-Based Angle
- A Uniform 10° Angle Does Not Account for Multiple Systems

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Avoidance Angles Required At Ka-Band

Table 1. Avoidance angles (°) required to ensure protection at the levels prescribed by Recommendation ITU-R S.1323-1

Interfering System	Victim System					
	T30	@contact	Hughes	LM	SkyBridge	TRW
T30		11.5	6	8	3	3
@contact	3		3	2	2	2
Hughes	4.5	12		8	2	2
LM	11.5	4	13		4.5	5
SkyBridge	3	15	1.5	2.5		0.5
TRW	1	2	0	1.5	0	

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Resulting Angles Fall Into Two Groups When Compared To A Fixed 10° Avoidance Angle

- In five of the fifteen cases, one of the angles is larger than 10° and the other is smaller.
- In ten of the fifteen cases, both angles are smaller than 10°.
- Both situations have drawbacks.
- In the first situation, a fixed-angle definition will overprotect one system while under-protecting the other, giving one of the systems a sort of regulatory windfall.
- In the second situation, both systems are over-constrained by the regulations, and each finds itself needing the other's permission to operate across the entire spectrum even at angular separations that (in real life) permit full-frequency operation by both systems without significant interference to either.

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An Analysis of the Situation When Avoidance Angles Are Above and Below 10°

- If the 10° angle is employed then one of the systems is overprotected while the other is under protected.

- Although this situation can in theory be resolved through coordination, the overprotected system has no incentive to agree to any angle larger than 10°, because such an agreement would only increase constraints on its operation without offering any offsetting benefit.

- The incentive for the overprotected system *not* to agree to expand the avoidance angle can be measured by the reduction in the percentage of time during which it potentially has to mitigate interference.

- On the other hand, the negative impact on the under-protected system can be measured by the reduction in the maximum link availability that can be offered by this system.

A Quantification of the Impact for the Situation When Avoidance Angles Are Above/Below 10°

Table 2. Situations where using a 10° default avoidance angle overprotects one system and under-protects the other

Overprotected System (A)		T30	LM	Hughes	LM	SkyBridge
Under Protected System (B)		@contact	T30	@contact	Hughes	@contact
Avoidance Angle (α) That Protects A and B (°)		11.5	11.5	12	13	15
Overprotected System (A)	Percentage of Time with One or More Unconstrained Satellite For 10° Avoidance Angle (%)	97.223	100.0	99.873	100.000	100.000
	Percentage of Time with One or More Unconstrained Satellite For α° Avoidance Angle (%)	96.442	99.996	99.510	100.000	100.000
Under Protected System (B)	Maximum Availability For 10° Avoidance Angle (%)	99.838	99.445	99.854	98.312	99.936
	Maximum Availability For α° Avoidance Angle (%)	99.969	99.604	99.971	99.774	99.971
	Percentage Increase in Maximum Unavailability (%)	422.6	40.2	403.5	646.9	120.7

An Analysis of the Situation When Avoidance Angles Are Both Below 10°

- In this situation, both systems *may* have an incentive to agree on an avoidance angle smaller than 10°.
- However, if there is no agreement on the avoidance angle then the 10° default will cause mitigation techniques to be implemented when they would not be at all necessary.
- This is certainly an inefficient use of the spectrum because capacity will be unnecessarily reduced in one or both systems during a certain percentage of time.
- The percentages of time that these systems have access to one or more unconstrained satellites are shown in Table 3, both for the case of using an avoidance angle of 10° and for the case of using the required avoidance angle to maintain mutual interference to ITU-R S.1323 levels.
- As illustrated in Table 3, if the 10° angle is employed, satellites of the two systems will be considered to be in an in-line event more often than they need to be, and thus be forced to split spectrum and/or implement diversity prematurely.

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A Quantification of the Impact for the Situation When Both Systems Are Protected By An Angle Less Than 10°

Table 3. Situations where both systems can be protected with an avoidance angle smaller than the 10° default

System A	System B	α °	Percentage of Time With One or More Unconstrained Satellites (%)			
			System A		System B	
			10°	α°	10°	α°
T30	Hughes	6	97.422	99.134	99.055	99.902
T30	SkyBridge	3	98.909	99.909	100.000	100.000
T30	TRW	3	97.113	99.779	96.012	99.782
@contact	LM	4	94.813	99.988	100.000	100.000
@contact	TRW	2	99.263	100.000	98.435	99.968
Hughes	SkyBridge	2	99.844	100.000	100.000	100.000
Hughes	TRW	2	99.936	100.000	98.647	99.953
LM	Skybridge	4.5	100.000	100.000	100.000	100.000
LM	TRW	5	100.000	100.000	95.211	99.190
SkyBridge	TRW	0.5	100.000	100.000	99.412	99.998

Adopting a Second Fixed Angle for "High-Powered" Systems Does Not Solve The Problem

- Each case is a different case and, as seen above for Ka-band NGSO FSS systems, avoidance angles based on some meaningful criterion (e.g. permissible levels of interference prescribed by Recommendation ITU-R S.1323-1) vary over a wide range of values
- Avoidance angles depend on a large number of system parameters and power is just one factor
- Moreover, as far as power levels are concerned, avoidance angles will depend on the relative power levels of the two systems rather than on absolute power levels
  - Therefore, a wider avoidance angle for "high-powered systems" could miss the mark more than a 10° angle would

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The Commission's Reasons for Selecting the Least Accurate Definition Do Not Justify the Decision

- A Uniform 10° Definition Will Not Encourage Coordination Because the Inaccuracies Will Often Favor One of the Parties
  - Example 1: With a 10° avoidance angle system B experiences interference above permissible levels (e.g., B requires a 15° angle) but system A doesn't (e.g., A is protected with a 5° angle)
    - A has no incentive to agree to any angle wider than 10°
  - Example 2: With a 10° avoidance angle both systems are overprotected (e.g., A is protected with an 8° angle and protection of B requires only 3°)
    - Both systems have an incentive to agree to a smaller angle but A might be willing to have the coordination exercise fail and the 10° default be used instead of agreeing to an angle smaller than 8°
- Simplicity is only superficially achieved
  - 10° avoidance angle simplifies text of the rule but complicates actual coordination
- A Fixed-Angle Definition Will Not Promote Homogenization Like the Two-Degree Spacing Requirement Did
  - GSO and NGSO environments are different (e.g. non-uniform orbit altitude and beam structure)
  - In the GSO case there was a multilateral rulemaking process with little bilateral coordination while in the NGSO case there will be a sequence of bilateral coordinations

A Definition Based on BER Time Allowances Should Be Adopted

- An “in-line event” is defined as the occurrence of any physical alignment of space and/or earth stations of two satellite networks in such a way that the angular separation between operational links of the two networks is less than the minimum angular separation required to guarantee that interference is not responsible for more than 10% of the time allowance for the BER specified in the short term performance objectives of either network, or more than a 10% decrease in the amount of reserve capacity available to links that require heavier coding to compensate for rain fading in either network, as applicable. (See Recommendation ITU-R S.1323-1.) If three satellite networks are in co-frequency operation, the coordination threshold shall be 7% rather than 10%, and if four or more satellite networks are in co-frequency operation, the coordination threshold shall be 5%.

The BER Time Allowance Definition Has Several Advantages

- Directly based on keeping mutual interference within the levels prescribed in Recommendation ITU-R S.1323-1 and therefore gives licensees certainty about the protection of licensed systems without constraining operations that would not cause interference to exceed permissible levels
- Computation of avoidance angles based on this definition is easily within the capability of a serious system proponent and is a pre-requisite for any coordination exercise
- Encourages rather than discourages coordination, because both parties have a strong incentive for reaching agreement on the avoidance angles that will ensure mutual protection
  - Arbitration prevents gamesmanship
- Is completely general and eliminates any need for classifying NGSO systems into different categories (e.g. “high-powered systems”)
- Includes the required flexibility to allow earth station-based and/or satellite-based angles to be used as required; and
- Addresses the need for keeping the mutual interference between any two systems within permissible levels when three or more systems are operational.

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Coordination Priority and Coordination Rules: Background

- Prior Statements on Ka-band Sharing
  - Second round licensees are subject to coordination with Teledesic
  - Teledesic has to coordinate in good faith to accommodate second round systems
  - No system will be forced to significantly alter its design for later licensees
- In the Ka-Band NPRM (Avoidance of In-Line Events Sharing Option), the Commission proposes:
  - "First-to-launch" coordination priority
  - BER time allowance definition of in-line events
  - Spectrum splitting as default sharing mechanism during in-line events
- According to the Ku-Band Order:
  - "First-to-launch" coordination priority
  - In-line events defined by 10° earth station-based angle
  - Spectrum splitting as default sharing mechanism during in-line events

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"First-to-Launch" as a Criterion to Define Coordination Priority

- May be appropriate as a "tiebreaker" within the same processing round
  - Traditionally systems within the same round have the same status
  - No pre-existing coordination priority
- Definitely not appropriate for systems in different rounds
  - Makes first round status irrelevant
  - Deprives licensees of requisite certainty
  - Deprives second-rounders of certainty vis-à-vis third round systems
  - NO LICENSEE EVER KNOWS ITS RIGHTS

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"Spectrum Splitting" as a Default Sharing Mechanism

- May be appropriate within the same processing round
  - Reaffirms the existing equality of rights
  - Does not discourage coordination because default is in line with pre-coordination expectations
- Definitely not appropriate for systems in different rounds
  - Deprives licensees of requisite certainty
  - Preempts coordination
  - Nullifies coordination priority
  - Ignores Commission's previous statements that coordination flexibilty depends on stage of deployment
- For systems in different processing rounds a default mechanism does not work even if biased in favor of the system from the earlier round

For Systems in Different Rounds an Alternative to Default Sharing Mechanisms is Needed

- Systems licensed in a given processing round should always seek coordination from systems licensed in previous rounds
- The latter systems have to coordinate in good faith to accommodate the new licensees
- Overly prescriptive default sharing mechanisms must be avoided to let genuine coordination take place
- More general coordination conditions should be adopted in order to promote all policy goals without preempting coordination

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